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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample and a personnel evaluation form are also included. (AG)

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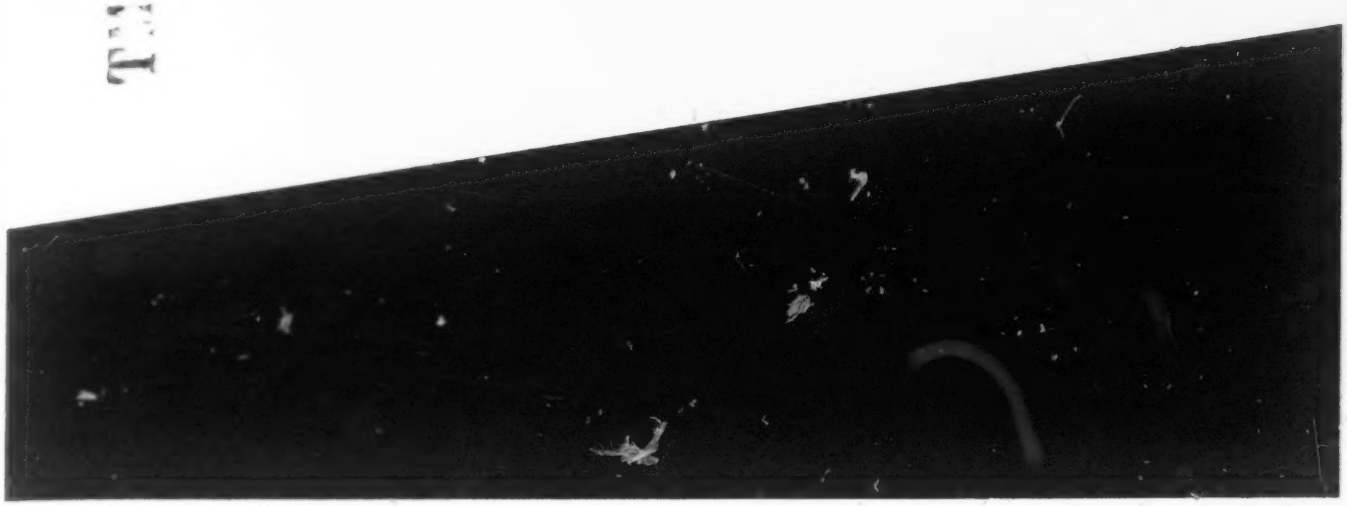
Development of USES Aptitude Test Battery for Electric Toothbrush Assembler

(elec. equip.) 723.884



U.S. DEPARTMENT OF LABOR
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BUREAU OF EMPLOYMENT SECURITY
Washington, D.C. 20210

Technical Report on Development of USES Aptitude Test Battery

For .....

Electric Toothbrush Assembler (elec. equip.) 723.884

S-383

U. S. Employment Service
in Cooperation with
North Carolina State Employment Service

September 1966

GATB Study #2590

DEVELOPMENT OF USES APTITUDE TEST BATTERY

For

Electric Toothbrush Assembler (elec. equip.) 723.884

S-383

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Electric Toothbrush Assembler, 723.884. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB, B-1002 Scores
Q - Clerical Perception	100
F - Finger Dexterity	75
M - Manual Dexterity	90

RESEARCH SUMMARY

Sample:

61 female applicants who were eventually employed as Electric Toothbrush Assemblers in North Carolina.

Criterion:

Supervisory ratings

Design:

Longitudinal (tests were administered prior to employment and criterion data were collected after training).

Minimum aptitude requirements were determined on the basis of a job analysis and statistical analyses of aptitude mean scores, standard deviations, aptitude-criterion correlations and selective efficiencies.

Predictive Validity:

Phi Coefficient = .28 ($P/2 < .025$)

Effectiveness of Norms:

Only 59% of the non-test-selected applicants used for this study were good workers; if the applicants had been test-selected with the above norms, 72% would have been good workers. 41% of the non-test-selected applicants used for this study were poor workers; if the applicants had been test-selected with the above norms, only 28% would have been poor workers. The effectiveness of the norms is shown graphically in Table 1:

TABLE 1

Effectiveness of Norms

	Without Tests	With Tests
Good Workers	59%	72%
Poor Workers	41%	28%

SAMPLE DESCRIPTION

Size:

N = 61

Occupational Status:

Applicants

Work Setting:

Applicants were eventually employed at the Sunbeam Corporation plant in Elkin, North Carolina.

Employer Selection Requirements:

Age: No fixed age requirement.

Education: Tenth grade education is preferred, but not adhered to when the applicant can cope adequately with the application card and interview.

Previous Experience: None

Tests: None

Other: Interview and background spot check.

Principal Activities:

The job duties for each worker are comparable to those shown in the job description in the Appendix.

Minimum Experience:

Duties of any station can be learned in a few hours. Several days are required to meet production on most stations. Each employee is expected to be thoroughly familiar with at least two stations within one month. All employees had at least four months of on-the job training at the time the final criteria were obtained.

TABLE 2

Means, Standard Deviations (SD), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education, and Experience

	Mean	SD	Range	r
Age (years)	29.4	8.9	19-47	-.241
Education (years)	10.8	1.5	7-13	.059
Experience (months: at time of criterion collection)	9.0	3.5	4-21	.382**

**Significant at the .01 level

EXPERIMENTAL TEST BATTERY

Parts 5, 7, 8, 9, 10, 11 and 12 of the GATB, B-1002A were administered to the sample group before they were employed by the company but the tests were not used in selection. (For two individuals the B-1001 had been administered. These scores were converted to their B-1002A equivalents). Parts 1, 2, 3, 4 and 6 of the GATB B-1002A were administered to the sample group in June 1965, concurrent with the collection of criterion data.

CRITERION

The supervisory ratings were prepared by the line foreman responsible for the work of the entire toothbrush assembly line. The first set of ratings was prepared in June 1965. The second set of ratings was obtained 2 1/2 months later in September 1965.

Rating Scale: A descriptive rating scale, form SP-21 was used for both first and second ratings. The scale (see Appendix) consists of seven items (six specific and one overall) of employee performance with five performance levels shown for each item.

Reliability: A Pearson Product-Moment correlation in the twenties was obtained between the first and second SP-21 ratings. A conference with the foreman failed to reveal any reason for this inadequate relationship. (The overall factor, item G, was dichotomized and a phi coefficient of .67 was computed between the first and second ratings indicating a satisfactory relationship between the two overall ratings.) Biserial correlations of .90 and .92 were computed then between SP-21 items A-F and G for the first and second ratings respectively. The second rating was selected as the final criterion because (1) the foreman had worked with the employees longer, (2) he had had a previous rating experience and (3) the second rating showed slightly higher internal consistency.

Criterion Score Distribution:		
	Possible Range:	7-35
	Actual Range:	18-31
	Mean:	24.3
	Standard Deviation:	3.3

Criterion Dichotomy: The criterion distribution was dichotomized into low and high groups by placing 41% of the sample in the low criterion group to correspond with the percentage of workers considered unsatisfactory or marginal. Workers in the high criterion group were designated as "good workers" and those in the low group as "poor workers." The criterion critical score is 23.

APTITUDES CONSIDERED FOR INCLUSION IN THE NORMS

Aptitudes were selected for tryout in the norms on the basis of a qualitative analysis of job duties involved and a statistical analysis of test and criterion data. Aptitudes F and M which do not have a high correlation with the criterion were considered for inclusion in the norms because the qualitative analysis indicated they were important for the job duties and the sample had a relatively high mean score on these aptitudes. Tables 3, 4, and 5 show the results of the qualitative and statistical analyses.

TABLE 3

Qualitative Analysis
(Based on the job analysis, the aptitudes indicated appear to be important to the work performed)

Aptitude	Rationale
P - Form Perception	Necessary to recognize and assemble parts of different size and shape, and to inspect parts and completed assembly.
K - Motor Coordination	Necessary to select and align small parts rapidly.

F - Finger Dexterity — Necessary in handling small parts and jigs of various sizes.

M - Manual Dexterity — Necessary in handling hand tools, jigs of various sizes, and cartons, boxes, and trays.

Means, Standard Deviations (SD), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB

Aptitudes	Mean	SD	Range	r
G - General Learning Ability	88.4	10.8	64-114	.147
V - Verbal Aptitude	89.1	10.4	70-117	.020
N - Numerical Aptitude	89.0	13.5	57-121	.189
S - Spatial Aptitude	89.6	14.6	65-120	.117
P - Form Perception	94.3	18.4	40-125	.193
Q - Clerical Perception	103.6	10.5	82-132	.255*
K - Motor Coordination	100.3	16.1	62-140	-.069
F - Finger Dexterity	102.0	20.2	56-144	.086
M - Manual Dexterity	106.2	17.9	64-150	.059

*Significant at the .05 level

TABLE 5

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data									
Important					X		X	X	X
Irrelevant									
Relatively High Mean						X		X	X
Relatively Low Standard Dev.	X	X	X			X			
Significant Correlation with Criterion						X			
Aptitudes to be Considered for Trial Norms						Q		F	M

DERIVATION AND VALIDITY OF NORMS

Final norms were derived on the basis of a comparison of the degree to which trial norms consisting of various combinations of Aptitudes Q, F, and M at trial cutting scores were able to differentiate between the 59% of the sample considered good workers and 41% of the sample considered poor workers. Trial cutting scores at five point intervals approximately one standard deviation below the mean are tried because this will eliminate about one third of the sample with three-aptitude norms. For two-aptitude trial norms, minimum cutting scores of slightly higher than one standard deviation below the mean will eliminate about one third of the sample. The Phi Coefficient was used as a basis for comparing trial norms. Norms of Q-100, F-75, and M-90 provided the highest degree of differentiation. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .28 (statistically significant at the .025 level).

TABLE 6

Predictive Validity of Test Norms Q-100, F-75, and M-90

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	13	23	36
Poor Workers	16	9	25
Total	29	32	61

Phi Coefficient (ϕ) = .28 Chi Square (X^2) = 4.64
Significance Level = $P/2 < .025$

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

The data for this study did not meet the requirements for incorporating the occupation studied into any of the 36 OAP's included in Section II of the Manual for the General Aptitude Test Battery. The data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.

SP-21
Rev. 1/66

A-P-P-E-N-D-I-X

UNITED STATES EMPLOYMENT SERVICE

DESCRIPTIVE RATING SCALE
(For Aptitude Test Development Studies)

Score____

RATING SCALE FOR _____

D. O. T. Title and Code

Directions: Please read the suggestions to raters on the back of this form and then fill in the items listed below. In making your ratings, only one box should be checked for each question.

Name of Worker (print) _____

(Last) (First)

Sex: Male___ Female___

Company Job Title: _____

How often do you see this worker in a work situation?

- ☐ See him at work all the time.
- ☐ See him at work several times a day.
- ☐ See him at work several times a week.
- ☐ Seldom see him in work situation.

How long have you worked with him?

- ☐ Under one month.
- ☐ One to two months.
- ☐ Three to five months
- ☐ Six months or more

A. How much work can he get done? (Worker's <u>ability</u> to make efficient use of his time and to work at high speed.)

- ☐ 1. Capable of very low work output. Can perform only at an unsatisfactory pace.
- ☐ 2. Capable of low work output. Can perform at a slow pace.
- ☐ 3. Capable of fair work output. Can perform at an acceptable but not a fast pace.
- ☐ 4. Capable of high work output. Can perform at a fast pace.
- ☐ 5. Capable of very high work output. Can perform at an unusually fast pace.

B. How good is the quality of his work? (Worker's ability to do high-grade work which meets quality standards.)

☐ 1. Performance is inferior and almost never meets minimum quality standards.

☐ 2. The grade of his work could stand improvement. Performance is usually acceptable but somewhat inferior in quality.

☐ 3. Performance is acceptable but usually not superior in quality.

☐ 4. Performance is usually superior in quality.

☐ 5. Performance is almost always of the highest quality.

C. How accurate is he in his work? (Worker's ability to avoid making mistakes.)

☐ 1. Makes very many mistakes. Work needs constant checking.

☐ 2. Makes frequent mistakes. Work needs more checking than is desirable.

☐ 3. Makes mistakes occasionally. Work needs only normal checking.

☐ 4. Makes few mistakes. Work seldom needs checking.

☐ 5. Rarely makes a mistake. Work almost never needs checking.

D. How much does he know about his job? (Worker's understanding of the principles, equipment, materials and methods that have to do directly or indirectly with his work.)

☐ 1. Has very limited knowledge. Does not know enough to do his job adequately.

☐ 2. Has little knowledge. Knows enough to "get by."

☐ 3. Has moderate amount of knowledge. Knows enough to do fair work.

☐ 4. Has broad knowledge. Knows enough to do good work.

☐ 5. Has complete knowledge. Knows his job thoroughly.

E. How much aptitude or facility does he have for this kind of work? (Worker's adeptness or knack for performing his job easily and well.)

☐ 1. Has great difficulty doing his job. Not at all suited to this kind of work.

☐ 2. Usually has some difficulty doing his job. Not too well suited to this kind of work.

☐ 3. Does his job without too much difficulty. Fairly well suited to this kind of work.

☐ 4. Usually does his job without difficulty. Well suited to this kind of work.

☐ 5. Does his job with great ease. Exceptionally well suited for this kind of work.

F. How large a variety of job duties can he perform efficiently? (Worker's ability to handle several different operations in his work.)

☐ 1. Cannot perform different operations adequately.

☐ 2. Can perform a limited number of different operations efficiently.

☐ 3. Can perform several different operations with reasonable efficiency.

☐ 4. Can perform many different operations efficiently.

☐ 5. Can perform an unusually large variety of different operations efficiently.

G. Considering all the factors already rated, and only these factors, how acceptable is his work? (Worker's "all-around" ability to do his job.)

☐ 1. Would be better off without him. Performance usually not acceptable.

☐ 2. Of limited value to the organization. Performance somewhat inferior.

☐ 3. A fairly proficient worker. Performance generally acceptable.

☐ 4. A valuable worker. Performance usually superior.

☐ 5. An unusually competent worker. Performance almost always top notch.

SUGGESTIONS TO RATERS

We are asking you to rate the job performance of the people who work for you. These ratings will serve as a "yardstick" against which we can compare the test scores in this study. The ratings must give a true picture of each worker or this study will have very little value. You should try to give the most accurate ratings possible for each worker.

These ratings are strictly confidential and won't affect your workers in any way. Neither the ratings nor test scores of any worker will be shown to anybody in your company. We are interested only in "testing the tests." Ratings are needed only for those workers who are in the test study.

Workers who have not completed their training period, or who have not been on the job or under your supervision long enough for you to know how well they can perform this work should not be rated. Please inform the test technician about this if you are asked to rate any such workers.

In making ratings, don't let general impressions or some outstanding trait affect your judgment. Try to forget your personal feelings about the worker. Rate him only on the way he does his work. Here are some more points which might help you:

1. Please read all directions and the rating scale thoroughly before rating

2. For each question compare your workers with "workers-in-general" in this job. That is, compare your workers with other workers on this job that you have known. This is very important in small plants where there are only a few workers. We want the ratings to be based on the same standard in all the plants.

3. A suggested method is to rate all workers on one question at a time. The questions ask about different abilities of the workers. A worker may be good in one ability and poor in another; for example, a very slow worker may be very accurate. So rate all workers on the first question, than rate all workers on the second question, and so on.

4. Practice and experience usually improve a worker's skill. However, one worker with six months' experience may be a faster worker than another with six years' experience. Don't rate one worker as poorer than another merely because he has not been on the job as long.

5. Rate the workers according to the work they have done over a period of several weeks or months. Don't rate just on the basis of one "good" day, one "bad" day or some single incident. Think in terms of each worker's usual or typical performance.

6. Rate only on the abilities listed on the rating sheet. Do not let factors such as cooperativeness, ability to get along with others, promptness and honesty influence your ratings. Although these aspects of a worker are important, they are of no value for this study as a "yardstick" against which to compare aptitude test scores.

Please write your name, title, company, city, state, and date of rating on a separate sheet of paper for each set of ratings you make.

S-383 A-P-P-E-N-D-I-X September 1966

FACT SHEET

Job Title: Electric Toothbrush Assembler 723.884

Job Summary: Assembles components of electric toothbrushes using hand and power tools.

Work Performed: Performs a combination of the following tasks: Operates resistance welder to weld wire to contact. Operates punchpress to rivet, stake, clamp, or press parts together. Dips wire into flux and inserts in specified part. Solders wire to part using stationary soldering tip, soldering iron, or soldering pot. Straightens and inserts end of wire into rotating head to twist wire end. Assembles parts by hand with or without hand tools. Oils pinions and gears by rubbing on oil covered plate. Tests motor assembly operation by observing milliamperage and voltage meters to determine current being drawn and listening for noise to detect signs of binding. Arranges wires on assembly in specified position and trims excess using diagonal pliers. Sets switch on assembly by bending spring and checking with shim gauge for performance within tolerances. Checks final motor assembly to determine if motor is running within specified speed tolerances using strobotac. Seals final unit using brush, acetone, and drying clamp. Visually inspects unit for appearance.

(This sheet is printed in duplicate. One copy should bemain as part of the Appendix in order to complete the technical report. The other copy can be removed by employment service personnel who wish to set up separate fact sheet files.)

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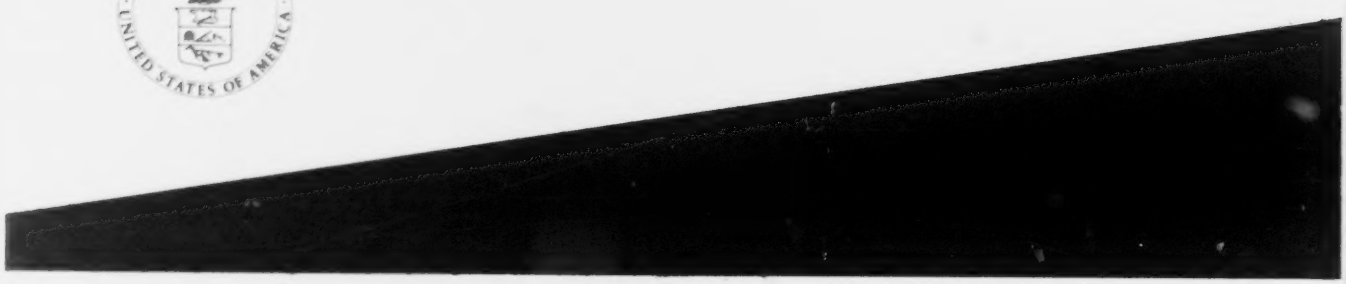

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